EXPERTISE

SAFETY FIRST:

THE IMPORTANCE OF ENGINEERING INSPECTION AND MAINTENANCE

Occasionally a dramatic news headline may grab our attention: "Coffee boiler explodes" or "Brake failure sends lift plummeting", for example. Such incidents, although thankfully rare, temporarily remind us that, when equipment fails, the consequences can be severe.

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Each day we come into contact with a wide range of equipment which requires regular inspection and maintenance to ensure its ongoing safety and suitability for the job intended. Escalators and lifts are common examples, but there are many more found both in work environments and in the public domain, including lifting platforms, forklift trucks and cranes. Much like a car going in for its service and MOT, plant and machinery also needs regular checks to reveal and subsequently fix defects and wear and tear.

Some employers may mistakenly believe that simply by maintaining their equipment, they are satisfying their legal and moral duties. In fact, it's crucial both to maintain and inspect plant regularly and there's an important distinction to make between the two terms.

The inspection of an item of plant or machinery is an activity carried out to identify any faults and defects before they present an unacceptable risk. It does not replace maintenance, which rather relates to necessary fixes and repairs which must be undertaken to bring a piece of machinery or kit back into full working order. As businesses come under ever-increasing pressure to evaluate the value of their spend, it might be tempting to look to cut costs in the area of inspection and maintenance. This is not only a false economy, but also a risky strategy, with potentially devastating consequences.

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WHY IS IT NEEDED?

Failing to carry out both inspection and maintenance activities can lead to a catastrophic outcome for an organisation for a number of reasons.

Firstly, there's the risk of injury which can be sustained when using a defective piece of equipment. Examples include entrapment, such as fingers being caught in moving parts of machinery; and explosion, where workers are hit by fragments of the failed item. According to the Health and Safety Executive (HSE), there were 555,000 self-reported non-fatal injuries in the workplace in 2017/18.[1] Employers have a legal and moral duty of care towards their employees and members of the public, to protect their health, safety and welfare; ensuring that plant and machinery are safe to use forms part of this obligation.

Then there's the risk of business interruption. Many companies rely on their equipment and machinery for keeping things running smoothly. If an engineer judges it to be unsafe, and informs the owner that it should not be used until all identified defects have been resolved, this could have serious repercussions for trade. For example, a car workshop with a defective car lifting platform might not be able to book vehicles in for repair; or a factory may have to pause or reduce production where workers are left unable to use an injection moulding machine. Wherever the integrity of a piece of kit is deemed below standard and considered unsafe to operate, it could result in business interruption. This can also have financial repercussions, such as loss of revenue and additional costs to bring equipment back into working order. Further, there may be reputational damage, especially where a health and safety breach makes the headlines.

Not least, there are potentially hefty fines for employers found to be negligent of carrying out appropriate inspection and maintenance activity. There may also be associated legal costs where a case is brought against a company or individual. In 2016, the Sentencing Council issued new sentencing guidelines for health and safety, corporate manslaughter and food safety and hygiene offences. These include establishing levels of culpability and harm in conjunction with the financial means or turnover of the defendant.

The current fine ranges for prosecutions under the Health and Safety at Work Act 1974 are:

- Companies with a turnover of not more than £2 million: **£50–£450,000**
- Companies with a turnover between £2 million and £10 million: **£100–£1.6m**
- Companies with a turnover between £10 million and £50 million: **£1,000–£4 million**
- Companies with a turnover of £50 million and over: **£3,000–£10 million**[2]

CASE STUDY:

A tyre factory in Carlisle was fined £512,000 when two workers were pulled into the same machinery and sustained arm injuries, on two separate occasions. The HSE deemed that the company had failed to ensure the machine was properly guarded and that insufficient inspection and review of the equipment had taken place following the first incident.

Source: BBC News, September 2018

1 http://www.hse.gov.uk/statistics/causinj/kinds-of-accident.pdf
2 Source: Sentencing Council: Health and Safety Offences, Corporate Manslaughter and Food Safety and Hygiene Offences.

WHAT EQUIPMENT NEEDS TO BE INSPECTED?

Any equipment which could pose a significant risk to health and safety needs to be inspected to ensure its ongoing integrity and suitability for the job intended.

Whilst many of us use some items of equipment frequently, such as escalators and lifts, we are probably unaware that they are subject to stringent health and safety laws. Lifts must comply with a piece of legislation called the 'Lifting Operations and Lifting Equipment Regulations 1998' (LOLER), meaning, amongst other things, they have to undergo a periodic thorough inspection. Escalators and moving walks don't fall under the requirements of LOLER; however they are also subject to regular, comprehensive inspections to ensure they are safe for continued use.

Named amongst the most dangerous pieces of apparatus used in industry are power presses. Falling under the Provision and Use of Work Equipment Regulations 1998 (or 'PUWER'), most power presses require a full inspection every six months. The constant demand placed on the guarding mechanism means that this part needs particular scrutiny, as accidents with power presses have occasionally resulted in amputation, due to entrapment with the moving parts of the equipment.

It's vital that any inspection is carried out by a 'competent person'; someone who has the necessary training, skills and experience to assess the equipment or machinery in question. They are able to recognise the implications of any defects identified and will know the actions to take. If a severe defect is identified, it could involve immediate removal of the relevant equipment from use. More information can be found on the Health and Safety Executive website: http://www.hse.gov.uk/

IN 2017, 84% OF CONVICTIONS IN HSE PROSECUTIONS RESULTED IN A FINANCIAL PENALTY AND 4% OF INDIVIDUAL CONVICTIONS RESULTED IN AN IMMEDIATE CUSTODIAL SENTENCE.

Statistics taken from "Sentencing in Health & Safety: Headlines and high fines", Clyde & Co.

HOW DO ENGINEER SURVEYORS INSPECT PLANT AND EQUIPMENT?

Engineer surveyors employ a variety of techniques when they inspect equipment.

Some items, such as cracks and breaks may be identified via a visual inspection to ensure they remain fit for purpose; however other defects may necessitate the use of more detailed inspection techniques to identify them. Engineer surveyors record any defects they find and categorise these according to severity.

Some less serious defects may require a minimal level of attention, but the equipment could remain safe to use for a certain period of time. Other types of defect require immediate rectification and result in the equipment being taken out of action until it has been fixed and deemed suitable for use again. Where a defect could pose, or already poses a danger to people, the owner must be made aware immediately. Additionally, legislation such as the Pressure Systems Safety Regulations 2000 (PSSR) and LOLER requires the enforcing authorities to be notified of a serious defect and presented with a copy of the inspection report. The relevant authority may then follow up on the report to ensure that the situation is satisfactorily resolved.

REMOTE VISUAL INSPECTION

Remote visual inspection (RVI) can be carried out where access would be challenging or unsafe for an engineer surveyor. Consisting of a lens, viewing eyepiece and light source, the tool can be used to examine boilers, generators and steam turbines, where construction permits, without the need to disassemble the equipment. This may also take the form of remotely operated high definition video or digital camera systems, thermal imagery or other optical camera methods. Whilst the technology was already being used in the 1970s, recent technological advances in videoscope technology and digital stereo measuring are bringing significant time savings, plus improving the accuracy of inspections.

NON-DESTRUCTIVE TESTING (NDT)

As the name suggests, non-destructive testing allows a suitably qualified practitioner to inspect machinery without destroying the serviceability of the part or parts. Such testing can take many forms including 'magnetic particle testing', 'ultrasonic testing', 'radiography' and 'vibration analysis' as well as several other techniques. In some cases, NDT can now be automated, helping speed up the process and allowing for inspection of larger components.

CONTINUOUS MONITORING

This refers to the process of continued monitoring of a facet of plant and machinery for any inconsistencies which could indicate the presence of a defect. This can take many forms and technology often plays a key role. Methods can range from vibration analysis, ultrasound testing and shock pulse monitoring (SPM). Various online monitoring and diagnostic systems exist to detect where a piece of equipment is not performing as expected. Some systems provide data on vibration frequency and severity, or can detect signals normally masked by machine noise, whereas other devices monitor temperature.

DRONES

Although not yet widely used, drones (or 'unmanned aerial vehicles') are already being recognised for their benefits in the field of engineering inspection. For equipment at height or in remote locations, such as cranes and bridges, drones can reach areas which are not easily navigable for humans. Additionally their cameras can capture high resolution images and transmit these to computers, allowing surveyors to detect issues before they become more serious. The consequences of failing to meet the minimum standards of inspection can be severe for a company and/or business owner and heavy financial penalties can be levied.

WHAT ACTION CAN EMPLOYERS TAKE?

Aside from ensuring that all plant and equipment is inspected regularly and in line with regulation, employers can also take out insurance cover, such as machinery breakdown or machinery business interruption insurance. This can help cover the cost of repair or replacement of machinery in the event that it suffers a breakdown, or is otherwise damaged or lost.

Employers should also ensure robust risk management procedures are in place. These include the wearing of appropriate protective clothing, such as safety glasses, hearing protection and safety shoes; having emergency stop controls where necessary; and using fixed guards. Additionally, all employees should receive the necessary information, training and supervision to perform their job safely.

SUMMARY

Inspection and maintenance are crucial activities for any business which requires workers to operate plant, machinery and equipment or, through usage of equipment where members of the public are exposed to a risk to their health and safety. Companies must ensure they employ competent individuals for the undertaking of such activity and that it is performed at appropriate intervals. Failure to do so could lead to equipment malfunctioning, resulting in business interruption, significant penalties and most seriously, injury and loss of life.

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